Incidence of Elongated Styloid Process: A Radiographic Study

Tushar Phulambrikar, Rajeshwari A, Balaji Rao, Ashish M Warhekar, Prashanthi Reddy

Professor, Department of Oral Medicine and Maxillofacial Radiology, SAIMS College of Dentistry and Dental Hospital, Indore, Madhya Pradesh, India

Professor and Head, Department of Oral Medicine and Maxillofacial Radiology, College of Dental Sciences and Hospital, Davangere, Karnataka, India

Former Professor and Head, Department of Oral Medicine and Maxillofacial Radiology, Bapuji Dental College and Hospital, Davangere, Karnataka, India

Senior Lecturer, Department of Oral Medicine and Maxillofacial Radiology, Modern Dental College and Research Centre, Indore, Madhya Pradesh, India

Correspondence: Tushar Phulambrikar, Professor, Department of Oral Medicine and Maxillofacial Radiology, SAIMS College of Dentistry and Dental Hospital, Indore Ujjain State Highway, Near MR 10 Crossing, Indore, Madhya Pradesh, India
e-mail: tukoplakia@hotmail.com

ABSTRACT

Many studies revealed that the styloid process and the stylohyoid chain presented considerable anatomic variability. Many times this elongated styloid process has also been attributed as a cause of pain and discomfort in the neck and throat region which was known as Eagle’s syndrome or styloid syndrome or stylohyoid syndrome. Hence, a study was designed to determine the length of styloid process on the orthopantomograph and review the selected related literature. A total of 200 healthy subjects of both the sexes in the age group of 5 to 75 years were radiographed. Each styloid process form both sides was classified to its morphologic appearance and measured. The data was subjected to statistical analysis which revealed elongation of styloid process increases as the age advances, when the incidence of elongation is compared on the right and left side no statistically significant difference is found. Pain is not associated with length or incidence of elongation.

Keywords: Styloid process, Eagle’s syndrome, Styloid syndrome, Stylohyoid syndrome.

INTRODUCTION

Most people think of bones simply as a stiffening framework deep inside the body. As far as it goes, this was true but the reality of bones and why we have them is somewhat different. In man, of course, bones reach their highest form of development. Each of the hundreds of different bones in the body being joined to the next to create a fantastically strong and yet agile framework called ‘Skeleton’.

Out of many of these bones there are two such processes, which are present on either side of the temporal bone, are called as styloid process. Typically, styloid process is a slender osseous projection, located in front of the stylomastoid foramen fused with the inferior aspect of the temporal bone. Dissection of human cadavers, inspection of macerated skulls, and evaluation of radiographs on live human subjects have revealed that the styloid process and the stylohyoid chain presented considerable anatomic variability. These variations involve the length of the styloid process, ossification and segmentation of the stylohyoid ligament, thickness of the bony parts and angle and direction of deviation and bending.

In the radiography of head and neck, it is not uncommon to find several variations and the styloid process is one among them which has been observed, quite routinely on the orthopantomograph. Many time this elongated styloid process has also been attributed as a cause of pain and discomfort in the neck and throat region as it first described by Weinlechner in 1877 and this was latter popularized by Eagle now known as Eagle’s syndrome or styloid syndrome, stylohyoid syndrome, etc.

Eagle originally described two distinct syndromes attributed to elongation of the styloid process. The first referred to as the classic syndrome, occurs following tonsillectomy. The second type, the carotid artery syndrome is not dependent upon tonsillectomy.

However, Eagle’s findings during 1930 and 1940 have been questioned over the years due to the documented variation in the length of styloid process and more over there exists not established association between the length of ossification and clinical symptoms. With these aspects we provoked interest to design a study, to determine the length of styloid process on the orthopantomograph and review the selected related literature.

MATERIALS AND METHODS

The study to determine the length of styloid process on the panoramic radiographs and document the incidence of elongation was conducted in the Department of Oral Medicine and Radiology of Bapuji Dental College and Hospital,
RESULTS

The study population comprised of 200 experimental subjects, they were in the age group of 5 to 75 years. The experimental subjects were subjected to radiographic examination (orthopantomographs).

Out of the 200 orthopantomographs, 27 excluded from the study due to inability to interpret the radiographs accurately for the technical or anatomical reasons. Thereafter the experimental samples comprised of 173 radiographs. They were divided into 5 age groups of 10 years duration viz, 5 to 14, 15 to 24, 25 to 34, 35 to 44 and 45 years and above. From the study population of 173 radiographs, 328 styloid processes were identified. The number of styloid processes which were visible on the right side was 162 and on the left side was 166. They were divided into 29 and 29 in 5 to 14 (group I), 27 and 27 in 15 to 24 (group II), 36 and 37 in 25 to 34 (group III), 35 and 37 in 35 to 44 (group IV), and 35 in 45 and above (group V) on the right and left side respectively (Table 1).

Out of the 328 styloid processes which were visible, 161 and 167 were distributed in males and females respectively (Table 2).

DISCUSSION

Mineralization in the area of the styloid process and/or stylohyoid-stylomandibular ligament complex is a rather common anatomic abnormality, which may be easily detected on panoramic radiographs.4

Length of the Styloids

In this study, the minimum length of the styloid was 5 mm and the maximum of 63 mm. The mean length of styloid as per this study is 23.2 ± 10.70 mm. This is consistent with 29.20 ± 4.58 mm of Monsour PA and Young WG (1986).12 According to Strauss et al 64.9% of styloids measured up to 25 mm and 24.8% showed elongation of styloid process.13 This is also reported by several others including Camarda AJ, Correll RW, Gossmon RJ, Smith GR and Cherry JE and Ferrario VF.2,5,8,11,14

Length of Styloid in Relation to Age

The mean length of styloids in this study were 14.2 ± 5.65, 23.1 ± 7.56, 22.5 ± 7.87, 25.7 ± 9.44 and 28.6 ± 12.34 mm in groups I, II, III, IV and V respectively.

These data revealed that the length of styloids increased as the age advanced steadily between 5 to 24 years and then it

![Table 1: Minimum, maximum and mean length of styloid process (sidewise)](attachment:image)

<table>
<thead>
<tr>
<th>Age group (years)</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-14</td>
<td>8</td>
<td>21</td>
<td>29</td>
<td>13.8 ± 4.98</td>
</tr>
<tr>
<td>15-24</td>
<td>10</td>
<td>36</td>
<td>46</td>
<td>23.2 ± 7.43</td>
</tr>
<tr>
<td>25-34</td>
<td>7</td>
<td>38</td>
<td>45</td>
<td>22.8 ± 7.25</td>
</tr>
<tr>
<td>35-44</td>
<td>15</td>
<td>38</td>
<td>53</td>
<td>23.0 ± 6.29</td>
</tr>
<tr>
<td>45 and above</td>
<td>15</td>
<td>51</td>
<td>66</td>
<td>28.5 ± 10.74</td>
</tr>
</tbody>
</table>

![Table 2: Incidence of elongation by age and sex (technique—I ≥ 30 mm)](attachment:image)

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Study population</th>
<th>Patients with abnormality (≥ 30 mm)</th>
<th>Incidence of elongation (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
<td>Total</td>
</tr>
<tr>
<td>5-14</td>
<td>16</td>
<td>16</td>
<td>32</td>
</tr>
<tr>
<td>15-24</td>
<td>13</td>
<td>17</td>
<td>30</td>
</tr>
<tr>
<td>25-34</td>
<td>19</td>
<td>18</td>
<td>37</td>
</tr>
<tr>
<td>35-44</td>
<td>18</td>
<td>20</td>
<td>38</td>
</tr>
<tr>
<td>45 and above</td>
<td>18</td>
<td>18</td>
<td>36</td>
</tr>
<tr>
<td>Total</td>
<td>84 (48.6%)</td>
<td>89 (51.4%)</td>
<td>173</td>
</tr>
</tbody>
</table>
remained stationary between the age periods of 25 to 34 and then marginally increased as age advanced.

**Incidence of Elongation of Styloid in Relation to Age**

The incidence of elongation of styloid process measured in this study was 0, 20, 27, 34.25 and 28.9% in 5 to 14 (group I), 15 to 24 (group II), 25 to 34 (group III), 35 to 44 (group IV) and above (group V) respectively, indicating that incidence of elongation increased as the age advanced and then dipped marginally between 45 years and above age group.

**Incidence of Elongation in Relation to Sex**

In this study, the mean length of styloids in males was 22.6 ± 8.98 mm and that of females was 23.7 ± 11.08 mm, which indicates sex has no role to play in elongation of styloids.

**Incidence of Elongation in Relation to Sides**

In this study, the incidence of elongation was 22.6% in males and 27.0% in females which was found statistically insignificant.

**Incidence of Elongation in Relation to Sides**

In this study, the incidence of elongation were 24.8% of which 46.5% showed unilateral elongations and 52.5% showed bilateral elongation.

**Incidence of Pain due to Elongation of Styloid Processes**

Pain could not be correlated despite the sufficiently large incidence of mineralization in the study. This is also in agreement with the view reported by Correll et al (1979) who stated that mineralization of stylohyoid ligament complex was fairly common, the abnormality rarely caused symptoms. Ferrario VF found a 0% incidence of symptoms with the incidence of mineralization of 84.8%. Camarda AJ, Deschamps C have reported a 0% incidence of any subjective symptoms from their study. The mean length of styloid process was subjected to statistical methodology resulted in a table which could be used clinically as a norm for that age group.

**CONCLUSION**

However, due to limitation of the three-dimensional structures viewed on the two-dimensional plane, their mediolateral orientation is not obtained very accurately thereby it becomes difficult to associate even a moderately elongated but medially projected styloid process, which would then impinge upon the regional neurovasculature and cause symptom. Further studies are suggested in the direction of application of digitization of the orthopantomography, computed tomography and cone-beam computed tomography and with larger sample size required to correlating the age with assessment of the length of the styloids and furthermore their relation to the structures in the neck and symptomatology.

**REFERENCES**